PALEONTOLOGY.—*New Western Hemisphere occurrences of fossil selachians.*[1]

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The specimens here described are among those fossil toothlike structures generally interpreted as rostral spines of pristid sharks. In particular, they are referable to the genera *Onchosaurus* Gervais and *Propristis* Dames. Obtained, respectively, from Ecuador and Georgia, they are of interest because neither genus seems to have been reported previously outside of Europe and North Africa; and the meager record of fossil pristids in the Western Hemisphere is raised, thus, to a total of six genera.[2]

The present specimens of *Onchosaurus* were transferred to the National Museum by the U. S. Geological Survey and those of *Propristis*, through the kind offices of S. C. Lyons, by the Georgia Kaolin Co. of Dry Branch, Ga. It is a pleasure to acknowledge with gratitude the cooperation of both of these organizations. The illustrations accompanying this note were prepared by William D. Crockett, scientific illustrator of the division of vertebrate paleontology, U. S. National Museum.

Onchosaurus cf. radicalis Gervais

This genus is represented by three fragmentary spines (U.S.N.M. nos. 18111, 18112, and 18113). The structures are strongly compressed, dorsoventrally. They presumably projected directly out from attachment along the lateral edge of a rostrum with little or no upward or downward flexure. They were, however, deflected posteriorly in a frontal plane as indicated by their convex anterior and concave posterior margins.

The teeth are composed, characteristically, of an exposed crown covered with smooth, unornamented enamel, and an unenamelled inserted root. Although no one crown among the present examples is entire, projection of the preserved edges shows this part to have had a triangular outline seen from either above or below, and to have occupied no more than one-third the longest axial dimension of the teeth. Proximally, at the anterior and posterior borders, the crown is slightly expanded to give an incipiently barbed appearance. Joining these barbs, the limit of enamel extends obliquely across the superior and inferior surfaces of the spine, arched in slight concavity toward the root. The free lateral edges of the crown are sharp.

In comparison with the reduced crown, the root portion of each spine comprises a notably long peduncle. This inserted part enlarges progressively from a thin, narrow distal neck adjacent to the crown to a maximum expansion at the proximal base. The peduncle is regularly ovate in section except near the base where the anterior and posterior margins are truncated. Here, the section is roughly quadrangular as is also the outline of the basal face. The sides of the root are marked by numerous coarse, alternating grooves and ridges which parallel the long axis of the spines. Those single anterior and posterior grooves are the most deeply incised but all are more pronounced proximally and tend to disappear distally. The furrows notch the circumference of the basal rim and are continuous with the ones radially arranged around the periphery of the shallow, elongate concavity occupying the proximal face of the root.

Measured in relation to its longest axis the best preserved spine (U.S.N.M. no. 18111, Fig. 1) possesses the following dimensions: total preserved length, 43.5 mm.; anterior height of root, 31.0; posterior height of root, 38.5; proximal width of root, 21.5; distal width of root, 11.5; proximal maximum thickness of root, 13.5; and distal minimum thickness of root, 6.0.

Geological horizon and locality.—Collected from the Upper Cretaceous (Turonian) on the left bank of the Rio Napo, one-fourth mile upstream from the village of Napo, Province of Oriente, Ecuador, by Joseph H. Sinclair and Theron Wasson, 1923.

Remarks.—The systematic and stratigraphic history of all the so-called ganopristine sharks was recently reviewed by Arambourg (1940). As treated therein, two subgeneric groups assigned a total of six previously described species from

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[2] The four genera of fossil pristids previously reported occurring in the Western Hemisphere are *Ischyrhiza* Leidy, *Onchopristis* Stromer, *Pristis* Linck, and *Schizorhiza* Weiler (cf. Dunkle, Journ. Washington Acad. Sci. **38**: 173–176. 1948; Hay, Carnegie Inst. Washington Publ. 390: 603–604, 719. 1929; Lofgren and Oliviera, Bol. Div. Geol. Misc., Rio de Janeiro, **106.** 1943; Romer, *Vertebrate paleontology*, ed. 2: 577. 1945; and Wetzel, Palaeontographica **73**: 94–97. 1930).

various Upper Cretaceous horizons were defined and referred to the genus *Onchosaurus*. Specifically, there are: (1) a subgenus *Onchosaurus* s. str. containing the species *radicalis* Gervais (1852) and *pharao* Dames (1887); and (2) a subgenus *Ischyrhiza* with the species *mirus* Leidy (1856a), *antiquus* Leidy (1856b), *stromeri* Checchia-Rispoli (1933), and *marocconus* Arambourg (1935).

It will be noted that the above references include various departures from the usages originally given some of these generic and specific names. The six species assigned to *Onchosaurus*, like the majority of other ganopristine forms, are based upon unassociated rostral spines. Stromer (1917, 1925, and 1927) has demonstrated wide variation in size and structure between individual teeth of the related and more adequately known sawfish, *Onchopristis*. It appears possible, therefore, that future discoveries of more complete remains of *Onchosaurus* may prove the changes in taxonomic concept proposed by Arambourg (1940) to have been premature. The attempted revision, however, serves an extremely useful basis for comparison, and in this connec-

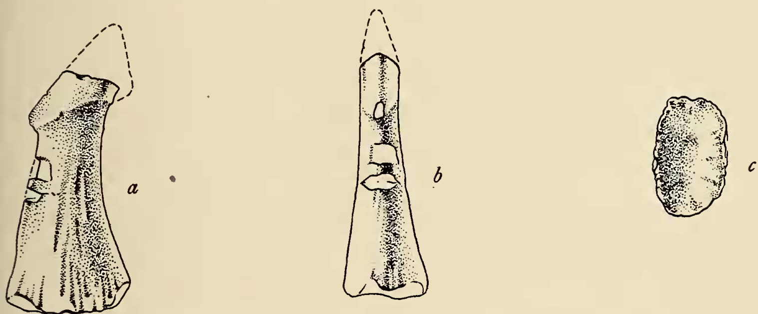

Fig. 1.—*Onchosaurus* cf. *radicalis* Gervais (U.S.N.M. no. 18111): Rostral spine from the Upper Cretaceous (Turonian) of Ecuador in (*a*) dorsal or ventral, (*b*) anterior, and (*c*) basal aspects. Approx. × 1.

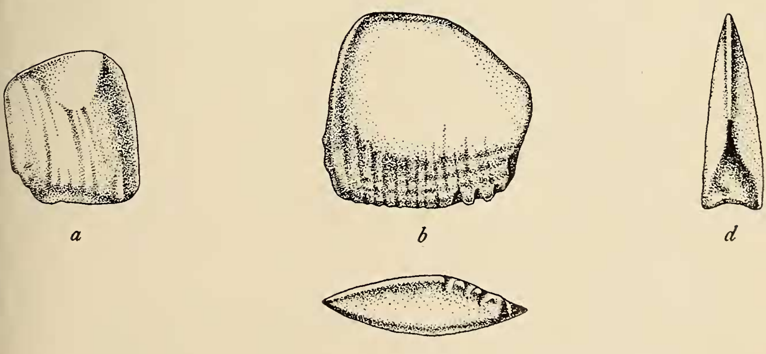

Fig. 2.—*Propristis* cf. *schweinfurthi* Dames: Rostral teeth from the upper Eocene (Jackson) of Georgia: (*a*) (U.S.N.M. no. 18216) in dorsal or ventral view; and (*b*, *c*, *d*) (U.S.N.M. no. 18215), respectively, in dorsal or ventral, basal, and anterior aspects. Approx. × 2.

tion, the presently recorded spines from Ecuador clearly pertain to the subgenus *Onchosaurus* s. str. Further, they agree in most essential details with specimens identified as *radicalis* and lacking the flattened and axially grooved posterior root border characteristic of *pharao*, are tentatively referred to the former, genotypic species.

Individually the six referred members of the genus *Onchosaurus* are relatively restricted, stratigraphically, but collectively, they comprise a typical Upper Cretaceous assemblage, ranging from the Cenomanian to the Danian. The species *radicalis* has been reported from just two Senonian localities in France. The Ecuadorian specimens were collected with fragmentary materials of *Squatina* sp., *Acrotemna faba*, and indeterminate shark vertebrae and a pycnodontid tooth plate. The Turonian age of these vertebrate remains was established upon associated invertebrate fossils identified by Reeside (in Wasson and Sinclair, 1927).

Propristis cf. **schweinfurthi** Dames

Two unassociated but well-preserved specimens (U.S.N.M. nos. 18216 and 18215, illustrated in Fig. 2), exhibit the basic characteristics of all the rostral spines previously assigned to this particular fossil sawfish.

Both teeth are strongly compressed, dorsoventrally, and viewed from either above or below, present irregularly quadrangular outlines. The forward border of each is the shortest of the four margins. Straight or even slightly concave in profile, this forward edge is flattened into a triangular area with broad, rugose proximal base tapering to a sharp distal apex. The entirely carinate posterior margin is weakly convex in profile and is the longest dimension exhibited by the teeth. From dorsal or ventral view, the basal margin is similarly convex, and the elliptical face of this inserted part is occupied by a shallow elongate concavity whose surface is roughened with the numerous openings of pores. The distal, exposed margin is in rounded confluence with both the anterior and posterior edges, and is rounded and polished smooth, apparently from functional wear.

Enamel as a tooth cap is absent. In consequence, the external textural appearance of the spines is reminiscent of that of the rostral teeth of *Pristis*. The upper and lower surfaces are marked by alternating low ribs and shallow grooves paralleling the longitudinal axes of the structures. These are crossed by less distinct transverse ridges which tend to converge from the posterior border toward the anterior edge. Like the comparable markings on the bases of *Onchosaurus* spines, these features are more deeply pronounced on the proximal surfaces and disappear distally.

Measured in relation to the longest axes, the specimens have the following dimensions: greatest over-all length, 18.5 and 14.0 mm.; maximum over-all width, 20.25 and 13.25; width of base, 16.5 and 9.5; maximum thickness of base 5.5 and 4.5.

Geological horizon and locality.—Collected from strata of upper Eocene (Barnwell or lower Jackson) age exposed in quarries of the Georgia Kaolin Co. near Dry Branch, Twiggs County, Ga., by S. C. Lyons, 1948.

Remarks.—The two unassociated rostral spines of *Propristis* from Georgia can not be distinguished with certainty from those of the North African *P. schweinfurthi* and hence are referred to that species (Fraas, 1907).

These North American examples were found associated with other vertebrate remains, namely: teeth of *Carcharias*, *Isurus*, *Myliobatis*, and *Sphraena;* and fragments of the carapace and plastron of the turtle *Amyda*. The source horizon of this faunule is a stratum of sand and fullers earth immediately overlying the extensively quarried Tuscaloosa kaolins. According to a recently published stratigraphic section (La Moreaux, 1946), measured in the quarries of the Georgia Kaolin Co. in Twiggs County, this sediment may be assumed to be of lower Jackson age. In consequence a slight extension of the known range of *Propristis* is indicated since the genus has been reported only from the middle Eocene of Birket el Qurun, Egypt.

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ENTOMOLOGY.—*Phylogeny and biogeography of the caddisflies of the genera* Agapetus *and* Electragapetus (Trichoptera: Rhyacophilidae).[1] Herbert H. Ross, Illinois Natural History Survey, Urbana, Ill.

An analysis of the phylogeny and distribution pattern of the small caddisflies belonging to the genus *Agapetus* and its allies has presented some interesting data on the movement of faunal elements between North America and Eurasia. For insects the time relations of this entire phase of distribution is poorly understood, although there is evidence in most groups of crossings between the parts of Holarctica. In the *Agapetus* group there is some evidence for placing such crossings in relation to geologic time.

The results of this study of the *Agapetus* line attest the fact that many small insect genera occupy a unique place in unraveling the phylogeny and morphogenetic steps in a large number of groups. This has been stressed by Emerson (1950) in his remarks on the objectivity of monotypic genera. In many instances these small genera are surviving members of early points in phyletic lines that have developed abundant faunas specialized far beyond these relicts. We are justified in regarding such archaic survivors as living fossils. In insect studies they are what we must use as a basis for phylogenetic deduction in theoretical areas of evolutionary speculation. In groups such as vertebrates and Mollusca, fossil evidence is used in this capacity.

It is my conviction that, by and large, insect groups possess more living fossils than vertebrate groups do true fossils and that, as a consequence, the entomologist has an unusual opportunity to contribute material basic to the study of biogeography and evolution.

Electragapetus is one of those archaic genera of which, fortunately, we have available both a well-preserved fossil and two existing species. Its study establishes the order of origin of the distinctive characters of *Agapetus* and allows the dating of at least part of the associated phylogenetic development. With this as a basis a preliminary analysis has been attempted of the origin, divergence, and dispersal of the entire *Agapetus* complex.

THE AGAPETUS LINE

The genus *Agapetus* represents a phyletic line (Fig. 15) that arose from the genus *Anagapetus* and that is characterized in the adult primarily by a reduction and reorganization of the veins of the hind wing. The apex of development in these characters occurs in the *fuscipes* complex of the genus *Agapetus*.

In *Anagapetus* the front wing (Fig. 1) is much like *Rhyacophila*. The hind wing is also little changed from the primitive rhyacophilid type; its radial field (Fig. 6) has all branches present and the forks of R_s occur before cross-vein *s*; and the anal veins are all present, with 1A and 2A forming an elongate fork. The genus *Catagapetus* represents the first steps toward *Agapetus*. In *Catagapetus* the front wing has lost vein R_{1a}, and cross-vein *r* has become aligned with cross-vein *s* (as in Fig. 2); and in the hind wing (Fig. 7) cross-vein *s* has moved basad. Existing species show reductions of hind wing venation that have occurred in the *Catagapetus* line since it separated from the main *Agapetus* stem.

In *Electragapetus* (Fig. 8) the first major steps in specialization are seen: fork R_{2+3} has migrated

[1] This paper is a joint contribution from the Section of Faunistic Surveys and Insect Identification, Illinois Natural History Survey, and the Department of Entomology, University of Illinois.